

73216

Impact melt Breccia

162.2 grams

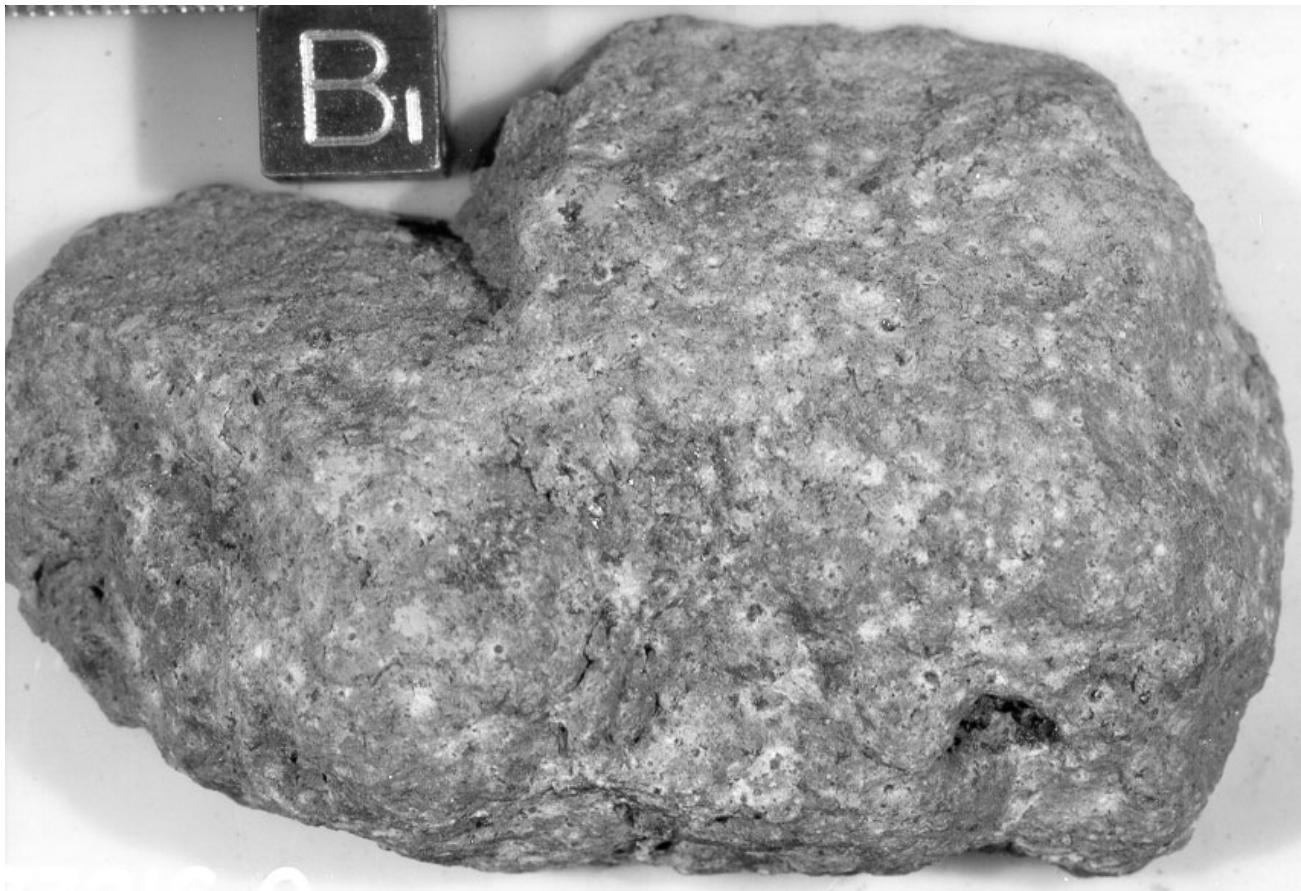


Figure 1: Photo of 73216 showing abundant micrometeorite craters. Cube is 1 cm. NASA S8946682.

## Introduction

Wolfe et al. (1981) describe 73216 as having a fine-grained granoblastic matrix. Ryder (1993) describe it as a crystalline impact melt containing angular mineral and lithic clasts, with the thin sections showing a fairly dark, fine-grained groundmass. It was picked up off the regolith from the rim of a ten meter crater and has micrometeorite pits on all sides (figure 1). It has not been dated.

## Petrography

Figure 5 shows the interior of 73216 with a few percent small cavities and vague clasts. Neal and Taylor (1998) studied five clasts extracted from the matrix of 73216. All of these clasts were found to have high Ir and Au contents.

## Significant Clasts

### *Gabbronoritic Anorthosite ,36 ,61 ,7001 (,66)*

This clast has a cumulate texture with interlocking plagioclase ( $An_{87-95}$ ), low-Ca pyroxene ( $Wo_{4-5}En_{75}$ ), high-Ca pyroxene ( $Wo_{38}En_{50}$ ) with some recrystallized zones evident by triple junctions. Small olivine grains ( $Fo_{91}$ ) occur as “necklaces” around large plagioclase grains. More details are given in Neal and Taylor (1998).

### *Recrystallized Anorthositic Gabbronorite ,38 ,62 ,7002 (,67)*

This clast has a granulitic to granoblastic texture composed of large plagioclase (up to 1.5 mm)( $An_{95-83}$ ), smaller olivine ( $Fo_{70}$ ), orthopyroxene ( $Wo_{4-5}En_{75}$ ), clinopyroxene ( $Wo_{29-39}En_{50}$ ) and fine plagioclase-rich

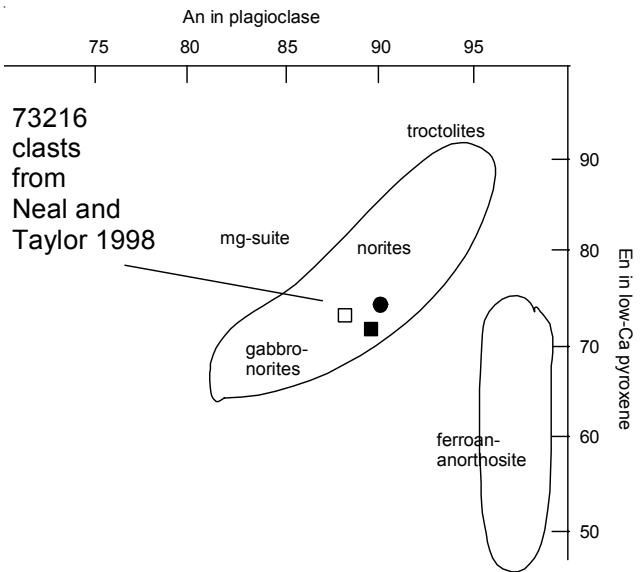


Figure 2: Composition of minerals in clasts in 73216.

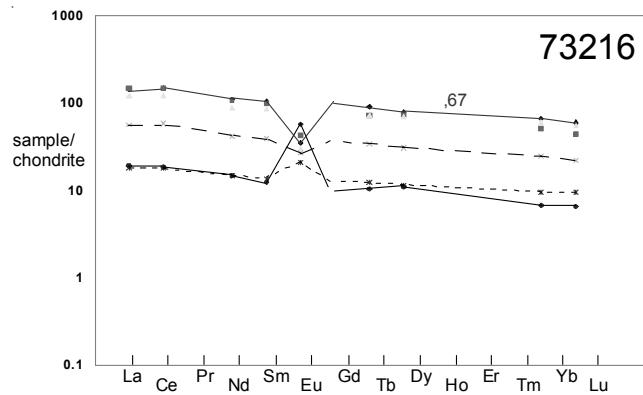


Figure 3: Normalized rare-earth-element diagram for clasts in 73216. Data from Table 1.

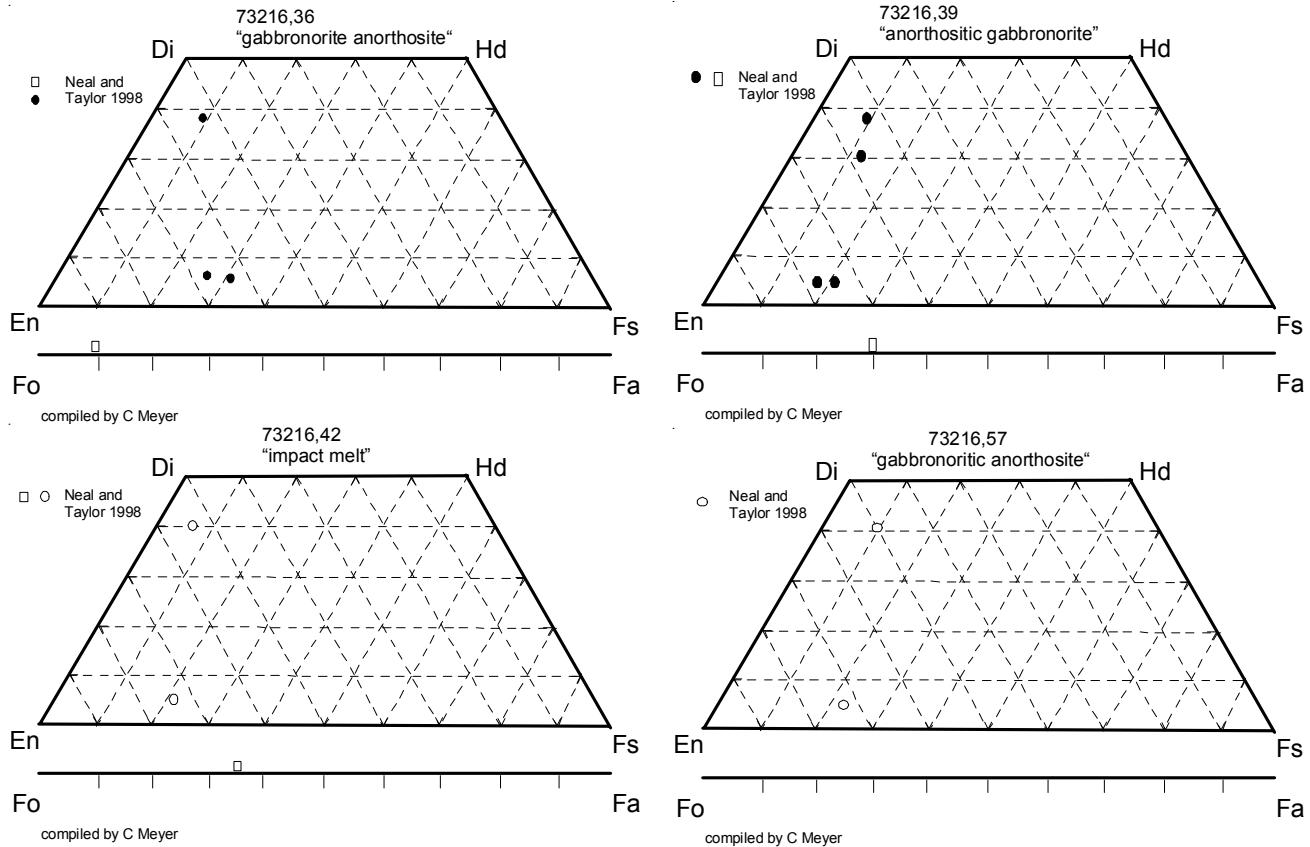


Figure 4: Pyroxene and olivine data for clasts in 73216 (from Neal and Taylor 1998).

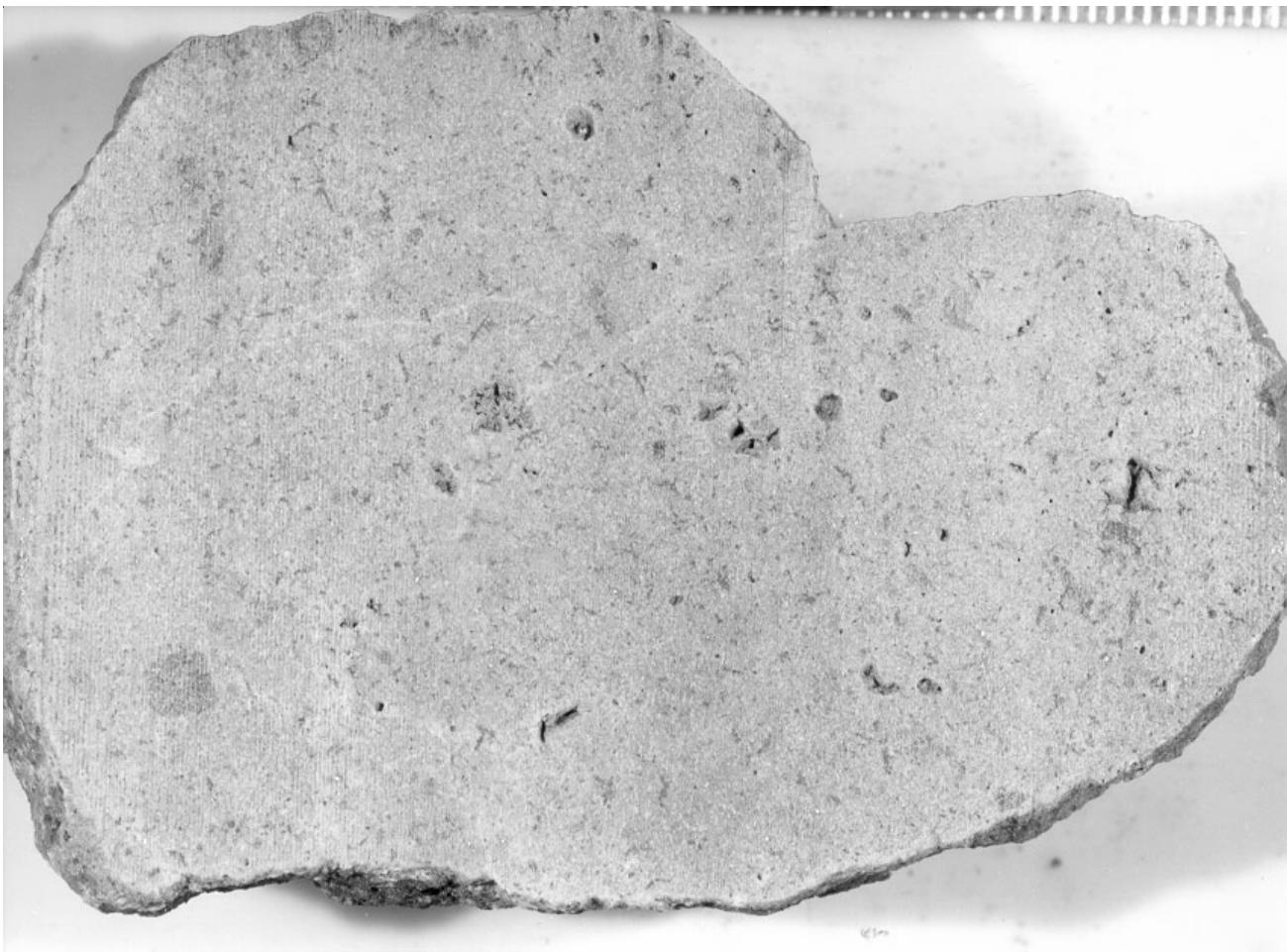


Figure 5: NASA S89-46683. Sawn surface of 73216,0 before breaking. About 7.5 cm across.

matrix. Devitrified impact melt permeates the breccia matrix and corrodes the larger plagioclase grains. Composition (determined by Roman Schmitt) is given in table 1, figure 4.

#### ***Devitrified Impact Melt ,42 ,63 ,7003 (,68)***

This clast has acicular plagioclase crystals forming a variolitic texture. Plagioclase is zoned  $An_{85-94}$ . Ilmenite needles tend to cut across the variolitic plagioclase. Olivine ( $Fo_{67}$ ) forms cores to pyroxene ( $Wo_{4.5}En_{75}$ ). More details are given in Neal and Taylor (1998).

#### ***Recrystallized Norite ,49 ,7004 (,69)***

This clast has a recrystallized cataclastic to granoblastic-annealed texture (Neal and Taylor 1998). Porphyroblasts of plagioclase ( $An_{93-96}$ ), skeletal ilmenite and low Ca-pyroxene are penetrated by devitrified impact melt glass.

#### ***Gabbronoritic Anorthosite ,57 ,65 ,7005 (,70)***

This clast exhibits a striking orthocumulate texture with intercumulus pyroxenes (up to 0.8 mm) set in a cumulus plagioclase ( $An_{98-93}$ ). The pyroxene ( $Wo_{4.5}En_{75}$  and  $Wo_{40}En_{50}$ ) contains exsolved lamellae indicating slow cooling.

#### **Chemistry**

No data on the matrix, only the clasts.

#### **Radiogenic age dating**

None

#### **Cosmogenic isotopes and exposure ages**

None

#### **Processing**

73216 was sawn in half (1989), but was not slabbed. There are 11 thin sections.

**Table 1. Chemical composition of 73216.**

	matrix	impact	norite	anor.	anor.	anor.	
reference	Neal and Taylor 1998 (analyses by Roman Schmitt)						
weight	,67	,68	,49	,60	,70	,229	
SiO <sub>2</sub> %							
TiO <sub>2</sub>	1.7	1.45	1.32	0.66	0.23	0.69	(a)
Al <sub>2</sub> O <sub>3</sub>	17.8	21.8	15.3	28.2	27.7	27.4	(a)
FeO	7.94	4.4	8.9	3.4	2.67	3.9	(a)
MnO	0.1	0.06	0.13	0.04	0.04	0.05	(a)
MgO	10.2	7	13.3	3.3	4.2	5.9	(a)
CaO	11.9	14.7	9.7	15.9	17.5	14.2	(a)
Na <sub>2</sub> O	0.71	0.75	0.57	0.64	0.39	1.21	(a)
K <sub>2</sub> O	0.36	0.39	0.24	0.14	0.03	0.18	(a)
P <sub>2</sub> O <sub>5</sub>							
S %							
sum							
Sc ppm	17.5	9.8	17.7	8.9	5.3	3	(a)
V	41	27	43	25	15	17	(a)
Cr	1260	700	1500	660	390	440	(a)
Co	20.8	8.2	18.6	20.1	5.8	5.8	(a)
Ni	190	80	160	170	60		(a)
Cu							
Zn							
Ga							
Ge ppb							
As							
Se							
Rb				4			(a)
Sr	220	270	140	200	190	410	(a)
Y							
Zr							
Nb							
Mo							
Ru							
Rh							
Pd ppb							
Ag ppb							
Cd ppb							
In ppb							
Sn ppb							
Sb ppb							
Te ppb							
Cs ppm	0.43	0.42	0.26				
Ba	390	430	320	170	80	130	(a)
La	34	35	29	13.1	4.3	4.5	(a)
Ce	89	89	73	35	11.1	11.3	(a)
Pr							
Nd	50	49	40	19	6.8	6.7	(a)
Sm	15.2	14.1	12.6	5.8	1.98	1.81	(a)
Eu	1.96	2.42	1.68	1.49	1.18	3.19	(a)
Gd							
Tb	3.3	2.6	2.6	1.22	0.45	0.38	(a)
Dy	19	18	17	7.5	2.8	2.7	(a)
Ho							
Er							
Tm							
Yb	10.7	8.3	9.7	4	1.55	1.09	(a)
Lu	1.45	1.08	1.35	0.53	0.23	0.16	(a)
Hf	12.4	10	9.6	3.4	1.02	0.9	(a)
Ta	1.92	1.49	1.32	0.55	0.13	0.19	(a)
W ppb							
Re ppb							
Os ppb							
Ir ppb	5				15		
Pt ppb							
Au ppb	4	8	5	8	11	6	
Th ppm	5.3	4.8	4.4	1.53	0.45	0.47	(a)
U ppm	1.5	1.4	1.3	0.42			(a)

technique: (a) INAA

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